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# 33.2 Blood and the Lymphatic System

- Explain the functions of blood plasma, red blood cells, white blood cells, and platelets.
- Describe the role of the lymphatic system.
- List three common circulatory diseases.
- Describe the connection between cholesterol and circulatory disease.

## Lesson Summary

**Blood** Blood has four main components:

- **Plasma** is a straw-colored fluid. It is about 90 percent water and 10 percent dissolved gases, salts, nutrients, enzymes, hormones, waste products, plasma proteins, cholesterol, and other important compounds. Parts of plasma help control body temperature, transport substances, and fight infection. Plasma proteins are involved in blood clotting.
- **Red blood cells** transport oxygen. Blood gets its red color from the iron in **hemoglobin**, a protein that binds oxygen in the lungs and releases it in the capillaries.
- **White blood cells** guard against infection, fight parasites, and attack bacteria.
- **Platelets** are cell fragments involved in blood clotting.

**The Lymphatic System** The lymphatic system is a network of vessels, nodes, and organs that collects the fluid that leaves the capillaries, "screens" it for microorganisms, and returns it to the circulatory system.

- **Lymph** is fluid that consists of blood components that have moved through the walls of capillaries.
- Lymph vessels transport materials and lymph nodes act as filters, trapping microorganisms, stray cancer cells, and debris.

**Circulatory System Diseases** Three common and serious diseases of the circulatory system are:

- Heart disease: A leading cause of heart disease is **atherosclerosis**, a condition in which fatty deposits called plaque build up in artery walls and eventually cause the arteries to stiffen. A heart attack occurs as heart muscle cells become damaged.
- Stroke: A clot that blocks a blood vessel in the brain may cause a stroke, which is the sudden death of brain cells when their blood supply is interrupted. A stroke can also occur if a weak vessel breaks and causes bleeding in the brain.
- High blood pressure, or hypertension, is usually defined as blood pressure higher than 140/90. Uncontrolled high blood pressure can damage the heart and blood vessels. It can also lead to heart attack, stroke, and kidney damage.

**Understanding Circulatory Disease** Cholesterol is a lipid that is part of animal cell membranes. It is transported in the blood primarily by two types of lipoproteins: low-density lipoprotein (LDL) and high-density lipoprotein (HDL). The liver manufactures cholesterol, but it also comes from animal product foods. High cholesterol levels, along with other risk factors, lead to atherosclerosis and higher risk of heart attack.

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# Blood

*For Questions 1–5, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.*

_____ **1.** Blood helps regulate body temperature and fight infections.

_____ **2.** The human body contains 8–10 liters of blood.

_____ **3.** Plasma is about 50 percent water.

_____ **4.** Albumin, globulins, and fibrinogen are nucleic acids in blood.

_____ **5.** Fibrinogen is necessary for blood clotting.

**6.** Complete the table to describe the characteristics and functions of blood.

| Component | Characteristics | Function |
|---|---|---|
| Plasma | | |
| Red blood cells | | |
| White blood cells | | |
| Platelets | | |

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# The Lymphatic System

*For Questions 7–14, write the letter of the correct answer on the line at the left.*

_____ **7.** Fluid and small particles that leave the blood are collectively called

**A.** plasma. **C.** platelets.
**B.** lymphocytes. **D.** lymph.

_____ **8.** Some of the lymph is collected in a network of vessels, nodes, and organs called the

**A.** circulatory system. **C.** respiratory system.
**B.** lymphatic system. **D.** excretory system.

_____ **9.** How does lymph help protect against infection?

**A.** It screens for microorganisms.
**B.** It causes fevers when viruses are present.
**C.** It removes defective DNA from cells.
**D.** It removes toxins from the liver.

_____ **10.** What moves lymph into ducts?

**A.** valves in the veins
**B.** the pumping action of the heart
**C.** pressure from skeletal muscles
**D.** the thin walls of capillaries

_____ **11.** Where does lymph return to the bloodstream?

**A.** through veins just below the shoulders
**B.** through veins in the legs
**C.** through arteries in the abdomen
**D.** through capillaries in the liver

_____ **12.** What nutrients does the lymphatic system pick up in the digestive tract and transport to the bloodstream?

**A.** fats and fat-soluble vitamins
**B.** water and water-soluble vitamins
**C.** water and proteins
**D.** fatty acids and cholesterol

_____ **13.** Which of the following is NOT a function of lymph nodes?

**A.** pumping blood to the lungs
**B.** trapping microorganisms
**C.** collecting cancer cells
**D.** gathering debris from the body

_____ **14.** Which organ of the lymphatic system stores platelets?

**A.** heart **C.** thymus
**B.** lymph node **D.** spleen

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## Circulatory System Diseases

**15.** Why is the first sign of a circulatory problem an event that affects the heart or brain?

_____

_____

_____

**16.** What is atherosclerosis?

_____

_____

_____

**17.** What is angina, and what causes it?

_____

_____

**18.** What is one cause of heart failure?

_____

_____

**19.** What is a heart attack, and what causes most heart attacks?

_____

_____

_____

**20.** How is a stroke like a heart attack?

_____

_____

_____

**21.** How does high blood pressure damage the heart?

_____

_____

_____

## Understanding Circulatory Diseases

*For Questions 22–25, complete each statement by writing the correct word or words.*

**22.** Cholesterol is transported through the body by _____ lipoprotein and _____ lipoprotein.

**23.** A cholesterol level in the range of _____ is considered normal.

**24.** Cholesterol is made in the _____, but can also be found in foods high in _____.

**25.** High cholesterol is one of the risk factors for _____ and heart attack.

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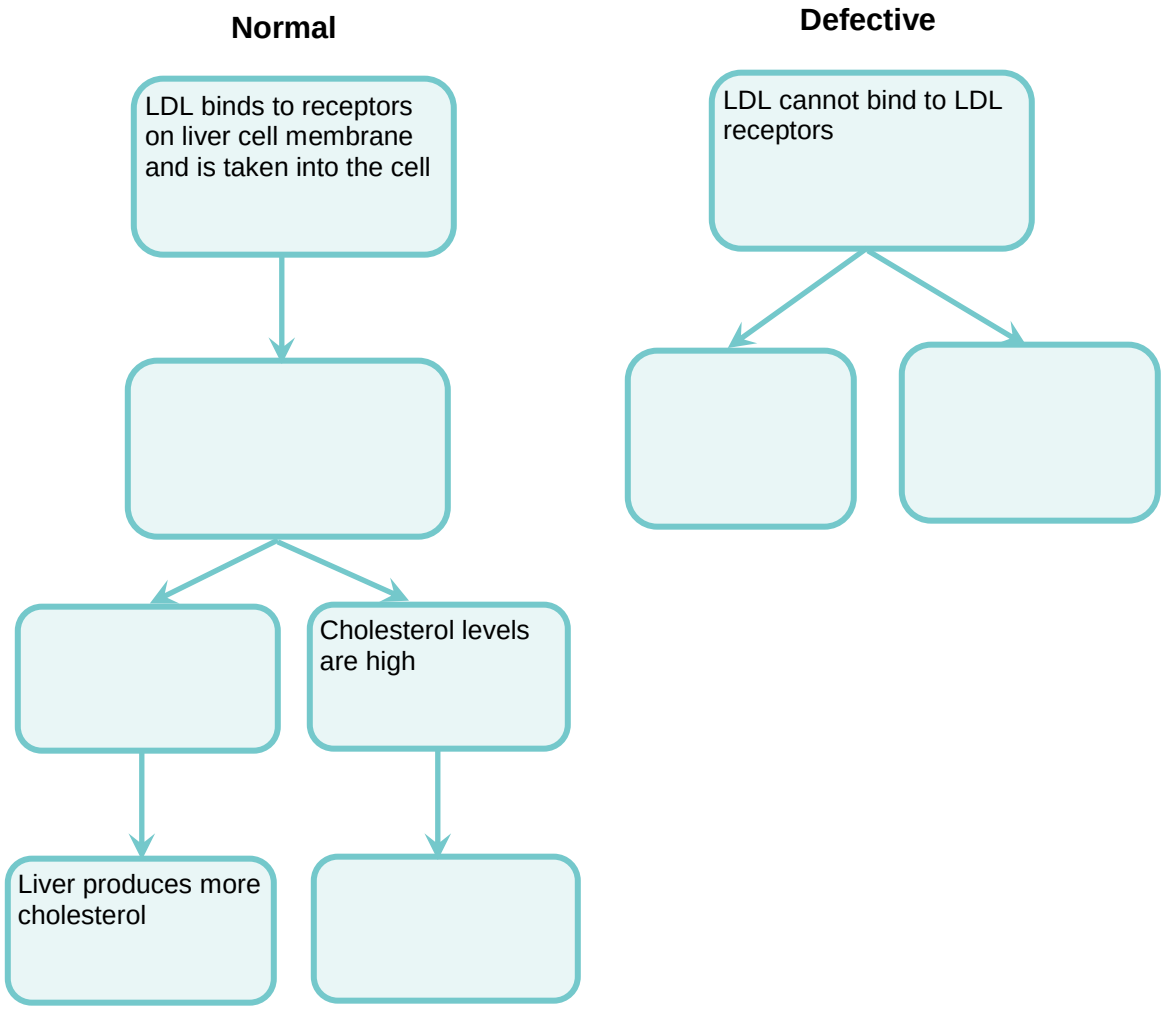
**26.** Fill in the concept map to compare the path of cholesterol in normal liver cells and defective liver cells.




**27.** What did Brown and Goldstein discover about people who eat high-fat diets?

_____

_____

_____

## Apply the Big idea

**28.** Heart disease, stroke, and high blood pressure are major killers in the United States, yet much can be done to prevent them. How can a healthy diet and exercise keep the circulatory system functioning properly to prevent these diseases?

_____

_____

_____

_____